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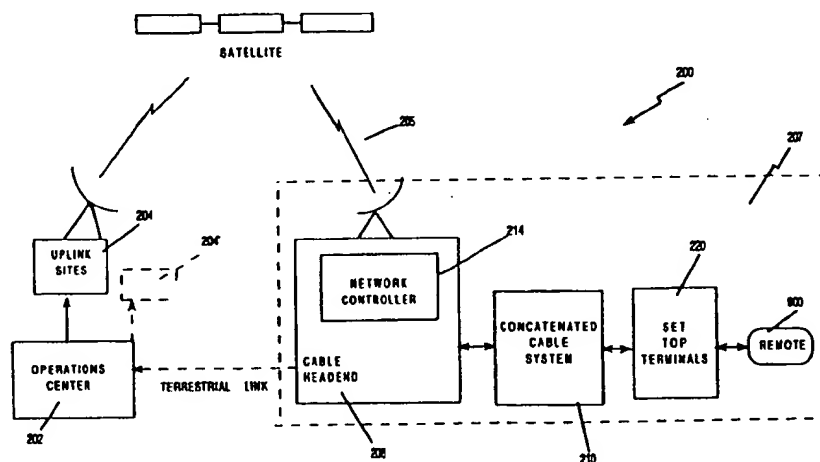
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(54) **Network controller for cable television delivery systems**

(57) An apparatus for targeting advertising to at  
least one subscriber comprising a means for gathering  
programs watched data from a subscriber and a proces-  
sor, operably connected to the gathering means, includ-  
ing a means for analysing gathered programs watched

data, a means for correlating the analysed programs  
watched data with at least one advertisement, and a  
means for selecting at least one correlated advertise-  
ment.



**Fig. 1**

broadcast and long-term subscriptions to movie channels. The TV industry is unable to sell its programming in large quantities on a unit per unit basis, such as the ordering of one program. Consumers prefer a unit sales approach because it keeps costs down and allows the consumer to be more selective in their viewing.

In today's television world, networks manage the program lineup for individual channels. Each network analyzes ratings for television shows and determines the appropriate schedule or program lineup to gain market share and revenue from advertising. Program ratings are determined using a test group of viewers and statistical analysis methods. Since each channel is in competition with every other channel, there is no coordinated effort to organize television programming in a manner that primarily suits the viewers.

Advertising has become equally annoying, with viewers being "forced" to watch television commercials for goods and services that are neither needed nor desired. As a result, consumers have become impatient and dissatisfied with today's television delivery systems. Equally problematic, these television delivery systems do not have the capabilities or features necessary to operate in the digital environment. Consequently, advances in digital technology call for a new television program delivery system that is capable of satisfying varying consumer and viewer needs.

Existing cable headends are unequipped for the transition to a digital system. These cable headends have no means for monitoring and controlling the large numbers of program signals and advertisements that will eventually be passed on to both consumers and viewers. These cable headends are unequipped to manage account and billing information for set top terminals without relying on telephone lines. In addition, these cable headends have no means for targeting advertisements to particular consumers and viewers.

What is needed is a network controller for a digital cable headend used in a television delivery system.

What is needed is a versatile network controller for a cable headend.

What is needed is a network controller for use in a cable headend that is capable of operating in both the digital and analog environment.

What is needed is certain components of a network controller for a digital cable headend used in a cable television delivery system.

What is needed is a network controller capable of controlling multiple video/audio program signals received by a cable headend from a satellite transponder.

What is needed is a network controller that can control the routing of both analog and digital video/audio program signals from cable headend to viewer homes.

What is needed is a network controller component for a cable headend that controls the combining the digital video/audio signals.

What is needed is a network controller that creates tiered programming by combining various digital video/audio signals.

What is needed is a network controller for a cable headend that accommodates different bandwidth availability between cable headend and certain viewer homes.

What is needed is a network controller capable of modifying program control information received from an external source.

What is needed is a network controller capable of targeting video to viewers.

What is needed is a network controller capable of targeting television commercials to specific consumers and viewers.

What is needed is a network controller capable of gathering information on programs watched by viewers.

What is needed is a better method of determining program ratings.

What is needed is a network controller capable of managing account and billing information.

The present invention is addressed to fulfill these needs.

#### **SUMMARY OF INVENTION**

The present invention is a network controller for a television delivery system. The network controller is the central component that provides monitoring and control of set top terminals in a television delivery system. The network controller is a key component of a digital cable television delivery system. The network controller of the present invention provides much greater capability and flexibility than existing cable headend control equipment.

The network controller of the preferred embodiment performs all its cable network monitoring and control of set top terminals within the cable headend. The cable headend receives and processes digitally compressed program signals before the signals are relayed to each set top terminal. Each cable headend site is equipped with multiple satellite receiver dishes and a signal processor.

As an intermediary between the set top terminals and the program delivery system's operations center (or other remote site), the cable headend relies on the network controller to perform key cable system operations. In particular, the network controller accommodates regional programming needs by working with other cable headend components. The network controller also performs the system control functions for the cable system.

It is an object of the invention to provide a network controller capable of retrieving data gathered at set top terminals.

It is an object of this invention to provide a network controller capable of managing account and billing information.

These and other objects and advantages of the invention will become obvious to those skilled in the art upon review of the following description, the attached drawings and appended claims.

## **DESCRIPTION OF THE DRAWINGS**

Figure 1 is a diagram of the primary components of the television delivery system.

Figure 2 is an overview of the television delivery system operations.

Figure 3 is a schematic of the operation of the primary components of the system.

Figure 4 is a diagram of the primary components of the cable headend.

Figure 5 is a diagram of the cable headend showing the primary components of the network controller.

Figure 6a is a schematic of a basic cable headend having network controller components.

Figure 6b is a schematic of an alternative embodiment of Figure 6a.

Figure 7 is a detailed diagram of the components of the cable headend.

Figure 8a is a drawing of a broadcast television menu screen to be displayed on a set top terminal.

Figure 8b is a drawing of a hit movie menu screen to be displayed on a set top terminal.

Figure 8c is a drawing of a hit movie description menu screen to be displayed on a set top terminal.

Figure 9a is a diagram for out-of-band two-way data transmission for a digital/analog headend.

Figure 9b is a diagram for in-band two-way data transmission for a digital/analog headend.

Figure 10a is a diagram of the polling request message format.

Figure 10b is a diagram of the polling response message format with an expanded view of the programs accessed block field.

Figure 11 is a diagram of the network controller CPU and its relational components.

Figure 12 is diagram of the network control database structure.

Figure 13 is a diagram of the relationship between the major software routines.

Figure 14 is a block diagram of the software flow chart for the Modifying PCI routine.

Figure 15 is a block diagram of the software flow chart for the Polling Cycle routine.

Figure 16 is a diagram of a sample programs watched matrix.

Figure 17 is a block diagram of the software flow chart for the Basic Advertisement Targeting routine.

Figure 18 is a block diagram of the subroutine flow chart for processing programs watched matrices through correlation algorithms.

Figure 19 is a diagram of the subroutine flow chart for determining final groupings of set top terminals.

Figure 20a is a diagram showing a sample assignment of advertising channels to set top terminal groups watching particular categories of programs.

Figure 20b is a diagram assigning available bandwidth for multiple advertising channels.

Figure 21 is a diagram of the software flow chart for an alternative to the Basic Advertisement Targeting routine.

Figure 22 is a diagram of the software flow chart for the Account/Billing routine.

Figure 23 is a diagram of an embodiment that uses remote statistical and billing sites.

## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

### **A. Television Program Delivery System Description**

#### **1. Introduction**

Figure 1 shows the present invention as part of an expanded cable television program delivery system 200 that dramatically increases programming capacity using compressed transmission of television program signals. Developments in digital bandwidth compression technology now allow much greater throughput of television program signals over existing or slightly modified transmission media. The program delivery system 200 shown provides subscribers with a user friendly interface to operate and exploit a six-fold or more increase in current program delivery capability.

Subscribers are able to access an expanded television program package and view selected programs through a menu-driven access scheme that allows each subscriber to select individual programs by sequencing a series of menus. The menus are sequenced by the subscriber using simple alpha-numeric and iconic character access or moving a cursor or highlight bar on the TV screen to access desired programs by simply pressing a single button, rather than recalling from memory and pressing the actual two or more digit numeric number assigned to a selection. Thus, with the press of a single button, the subscriber can advance from one menu to the next. In this fashion, the subscriber

the operations center 202 may package the same programs into different categories and menus for weekday, prime-time viewing and Saturday afternoon viewing. Also, the operations center 202 packages the television programs in a manner that enables both the various menus to easily represent the programs and the subscribers to easily access the programs through the menus.

5 The packaging of the digital signals is typically performed at the operations center 202 by computer assisted packaging equipment (CAP). The CAP system normally includes at least one computer monitor, keyboard, mouse, and standard video editing equipment. A programmer packages the signals by entering certain information into the CAP. This information includes the date, time slot, and program category of the various programs. The programmer and the CAP utilize demographic data and ratings in performing the packaging tasks. After the programmer selects the various  
10 programs from a pool of available programs and inputs the requisite information, the programmer, with assistance from the CAP, can select the price and allocate transponder space for the various programs. After the process is complete, the CAP displays draft menus or program schedules that correspond to the entries of the programmer. The CAP may also graphically display allocation of transponder space. The programmer may edit the menus and transponder allocation several times until satisfied with the programming schedule. During the editing, the programmer may direct the  
15 exact location of any program name on a menu with simple commands to the CAP.

The packaging process also accounts for any groupings by satellite transponder which are necessary. The operations center 202 may send different groups of programs to different cable headends 208 and/or set top terminals 220. One way the operations center 202 may accomplish this task is to send different program packages to each transponder. Each transponder, or set of transponders, then relays a specific program package to specific cable headends  
20 208 and/or set top terminals 220. The allocation of transponder space is an important task performed by the operations center 202.

The operations center 202 may also "insert" directions for filling local available program time in the packaged signal to enable local cable and television companies to fill the program time with local advertising and/or local programming. Consequently, the local cable headends 208 are not constrained to show only programs transmitted from the operations  
25 center 202. New set top converters will incorporate both digital and analog channels. Therefore, the cable headend 208 may combine analog signals with the digital signals prior to transmitting the program signals to the set top terminals 220.

After the CAP packages the programs, it creates a program control information signal to be delivered with the program package to the cable headend 208 and/or set top terminal 220. The program control information signal contains  
30 a description of the contents of the program package, commands to be sent to the cable headend 208 and/or set top terminal 220, and other information relevant to the signal transmission.

In addition to packaging the signal, the operations center 202 employs digital compression techniques to increase existing satellite transponder capacity by at least a 4:1 ratio, resulting in a four-fold increase in program delivery capability. A number of digital compression algorithms currently exist which can achieve the resultant increase in capacity  
35 and improved signal quality desired for the system. The algorithms generally use one or more of three basic digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame (interframe) compression, and (3) within carrier compression. Specifically, in the preferred embodiment, the MPEG 2 compression method is used. After digital compression, the signals are combined (multiplexed) and encoded. The combined signal is subsequently transmitted to various uplink sites 204.

40 There may be a single uplink site 204 or multiple uplink sites (represented by 204', shown in phantom in Figure 1) for each operation center 202. The uplink sites 204 may either be located in the same geographical place or may be located remotely from the operations center 202. Once the composite signal is transmitted to the uplink sites 204, the signal may be multiplexed with other signals, modulated, upconverted and amplified for transmission over satellite. Multiple cable headends 208 may receive such transmissions.

45 In addition to multiple uplinks, the delivery system 200 may also contain multiple operations centers. The preferred method for using multiple operations centers is to designate one of the operations centers as a master operations center and to designate the remaining operations centers as slave operations centers. In this configuration, the master operations center coordinates various functions among the slave operations centers such as synchronization of simultaneous transmissions and distributes the operations workload efficiently.

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#### 4. Cable Headend

After the operations center 202 has compressed and encoded the program signals and transmitted the signals to the satellite, the cable headend 208 receives and further processes the signals before they are relayed to each set top  
55 terminal 220. Each cable headend site is generally equipped with multiple satellite receiver dishes. Each dish is capable of handling multiple transponder signals from a single satellite and sometimes from multiple satellites.

As an intermediary between the set top terminals 220 and the operations center 202 (or other remote site), the cable headend 208 performs two primary functions. First, the cable headend 208 acts as a distribution center, or signal

The set top terminal 220 has a plurality of input and output ports to enable it to communicate with other local and remote devices. The set top terminal 220 has an input port that receives information from the cable headend 208. In addition, the unit has at least two output ports which provide communications from the set top terminal 220 to a television and a VCR. Certain menu selections may cause the set top terminal 220 to send control signals directly to the VCR to automatically program or operate the VCR. Also, the set top terminal 220 contains a phone jack which can be used for maintenance, trouble shooting, reprogramming and additional customer features. The set top terminal 220 may also contain stereo/audio output terminals and a satellite dish input port.

Functionally, the set top terminal 220 is the last component in the delivery system chain. The set top terminal 220 receives compressed program and control signals from the cable headend 208 (or, in some cases, directly from the operations center 202). After the set top terminal 220 receives the individually compressed program and control signals, the signals are demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in local storage (from which the menu template may be created), executed immediately, or sent directly to the television screen.

After processing certain signals received from the cable headend 208, the set top terminal 220 is able to store menu templates for creating menus that are displayed on a subscriber's television by using an array of menu templates. Before a menu can be constructed, menu templates must be created and sent to the set top terminal 220 for storage. A microprocessor uses the control signals received from the operations center 202 or cable headend 208 to generate the menu templates for storage. Each menu template may be stored in volatile memory in the set top terminal 220. When the set top terminal receives template information it demultiplexes the program control signals received from the cable headend 208 into four primary parts: video, graphics, program logic and text. Each menu template represents a different portion of a whole menu, such as a menu background, television logo, cursor highlight overlay, or other miscellaneous components needed to build a menu. The menu templates may be deleted or altered using control signals received from the operations center 202 or cable headend 208.

Once the menu templates have been stored in memory, the set top terminal 220 can generate the appropriate menus. In the preferred embodiment, the basic menu format information is stored in memory located within the set top terminal 220 so that the microprocessor may locally access the information from the set top terminal instead of from an incoming signal. The microprocessor next generates the appropriate menus from the menu templates and the other menu information stored in memory. The set top terminal 220 then displays specific menus on the subscriber's television screen that correspond to the inputs the subscriber selects.

If the subscriber selects a specific program from a menu, the set top terminal 220 determines on which channel the program is being shown, demultiplexes and extracts the single channel transmitted from the cable headend 208. The set top terminal 220 then decompresses the channel and, if necessary, converts the program signal to an analog NTSC signal to enable the subscriber to view the selected program. The set top terminal 220 can be equipped to decompress more than one program signal, but this would unnecessarily add to the cost of the unit since a subscriber will generally only view one program at a time. However, two or three decompressors may be desirable to provide picture-on-picture capability, control signal decompression, enhanced channel switching or like features.

In addition to menu information, the set top terminal 220 may also store text transmitted from the cable headend 208 or the operations center 202. The text may inform the subscriber about upcoming events, billing and account status, new subscriptions, or other relevant information. The text will be stored in an appropriate memory location depending on the frequency and the duration of the use of the textual message.

Also, optional upgrades are available to enhance the performance of a subscriber's set top terminal 220. These upgrades may consist of a cartridge or computer card (not shown) that is inserted into an expansion slot in the set top terminal 220 or may consist of a feature offered by the cable headend 208 or operations center 202 to which the user may subscribe. Available upgrades may include on line data base services, interactive multi-media services, access to digital radio channels, and other services.

In the simplest embodiment, available converter boxes such as those manufactured by General Instruments or Scientific Atlanta, may be modified and upgraded to perform the functions of a set top terminal 220. The preferred upgrade is a circuit card with a microprocessor which is electronically connected to or inserted into the converter box.

## 6. Remote Control Device

The primary conduit for communication between the subscriber and the set top terminal 220 is through the subscriber interface, preferably a remote control device 900. Through this interface, the subscriber may select desired programming through the system's menu-driven scheme or by directly accessing a specific channel by entering the actual channel number. Using the interface, the subscriber can navigate through a series of informative program selection menus. By using menu-driven, iconic or alpha-character access, the subscriber can access desired programs by simply pressing a single button rather than recalling from memory and pressing the actual channel number to make a selection. The subscriber can access regular broadcast and basic cable television stations by using either the numeric keys on the remote control 900 (pressing the corresponding channel number), or one of the menu icon selection options.

receiver 203 and transmitted to the signal processor 209.

The signal processor 209 prepares the program signals 205 that are received by the cable headend 208 for transmission to each set top terminal 220. In the preferred system, the network controller 214 supervises and, in some cases, instructs the signal processor 209 in routing the signals to subscribers. In this way, the network controller 214 and signal processor 209 work with one another to perform basic control functions in the cable television system 200. Typically this work is accomplished by the transfer of control information, represented at 211, between the network controller 214 and the signal processor 209.

Although it is preferred that the signal processor 209 and network controller 214 be co-located at the cable headend 208, the network controller 214 may be remotely located from the cable headend 208, as long as it remains in communication with the signal processor 209 in order to exchange control information 211.

In many instances, the program signals 205 received from the operations center 202 must be modified prior to being sent to the set top terminals 220. These modifications to the program control information 211 are made by the network controller 214 working in conjunction with the signal processor 209 to send a set top terminal control information stream (STTCIS). From the signal processor 209, the network controller 214 receives the program signals 205, which include cable franchise specific information added by the operations center 202. The network controller 214 modifies the program signals 205, if necessary, and communicates the new information back to the signal processor 209. The signal processor 209 then forwards the information to the set top terminal 220 in the form of the STTCIS, arrow 215. In most instances, the network controller 214 will modify the program signals 205 by adding additional information; however, the program signals 205 can be passed through the cable headend 208 to the set top terminal 220 without any modification.

The signal processor 209 and network controller 214 are both capable of handling the addition of simple local availabilities (e.g., local advertisements) into the signal sent to the set top terminal 220. The network controller 214 is also capable of handling more sophisticated local programming needs such as targeting video commercials, infomercials, interactive programming and certain data services. The network controller 214 receives all electronic signals sent by the set top terminal 220, including those sent in response to interactive service requests and some data service requests. The network controller 214 coordinates the necessary switching and access to allow the subscriber to enjoy these services.

The network controller 214 has the capability of performing "on the fly programming" changes, assisting in (i) masking portions of subscriber's television screens (split screen video), (ii) selecting different audio signals for the same video (foreign languages), and (iii) interactive features. In addition, the network controller can create programming changes. For last minute changes to programming (such as for a local emergency or important regional events), an operator using the network controller 214 can modify the program signals 209 "on the fly" and change menus available to the subscriber. This accommodates short notice changes to program packaging that cannot be handled by the operations center 202 in advance.

In order to accommodate split screen techniques for promo and demo video (which will be described later), undesired video portions of the television or menu screen may be masked. The network controller 214 can send the necessary control information to inform the set top terminal 220 to mask portions of a specific channel's video. For example, a video channel with a split screen showing four separate videos would require a three-fourths mask to focus the viewer on the featured video clip.

Tiered programming allows different users to view different video even though they are "tuned" to the same channel. For example, the network controller 214 may know the demographics of its subscribers through a database generated, in part, from prior subscriber choices, an interactive selection, or other means. Using the demographics information, the network controller 214 may target commercials to the correct audience by showing different commercials to subscriber's with different demographics. Information on programs watched may also be used to target commercials. Even though subscribers will believe they are "tuned" to one channel, they will be switched to a different channel for the tiered video and targeted commercial. Alternatively, individual subscribers may be offered a menu with the option of several commercials from which to choose.

To accommodate foreign speaking subscribers, multiple audio channels for television programming may be provided. The subscriber may be shown menus of programs available in the subscriber's native language. The function of choosing the correct audio to correspond to the selected language may be handled by either the set top terminal 220 or the network controller 214 depending upon the configuration. Local programming in several languages or additional audio channels for a foreign language translation of a popular television program may be provided by the network controller 214. Using a picture-on-picture feature, sign language may be similarly made available to certain set top terminals 220 for the deaf. The sign language video may be transmitted to the set top terminal 220 on a separate channel. Also, a text overlay for the deaf may be easily produced on the lower part of the screen. The control signals for producing the text overlay may be handled by the network controller 214.

In other embodiments, the network controller 214 can act as a central computer and provide intra-set top terminal interactive games, inter-set top terminal interactive games, computer bulletin board type services, message services (Electronic mail), etc. For example, a subscriber may play war games with six of his (anonymous) fellow subscribers

subscriber. In the preferred embodiment, the program control information signal is stored and modified by the network controller 214 and sent to the set top terminal 220 in the form of a set top terminal control information stream (STTCIS). This configuration can accommodate, among other things, differences in individual cable systems and possible differences in set top terminal 220 devices.

5 The set top terminal 220 integrates either the program control signal or the set top terminal control information stream together with data stored in the memory of the set top terminal 220, to generate on-screen menu displays for assisting the subscriber in choosing programs for viewing. (Throughout the description the term "program control information" is being used to indicate control information coming from the cable headend 208 to the set top terminal 220, whether it is sent directly from the operations center 202, processed by the network controller 214 and then forwarded  
10 to the set top box (STTCIS), or transmitted over telephone lines.)

The types of information that can be sent using the program control signal includes: number of program categories, names of program categories, what channels are assigned to a specific category (such as specialty channels), names of channels, names of programs on each channel, program start times, length of programs, description of programs, menu assignment for each program, pricing, whether there is a sample video clip for advertisement for the program, and  
15 any other program, menu or product information. In addition, the program control information signal may be used periodically to reprogram or reconfigure a set top terminal 220 or group of set top terminals 220 (described in detail in co-pending patent application Ser. No. PCT/US93/11708, entitled REPROGRAMMABLE TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM, filed by the same assignee incorporated herein by reference).

20 The goal of the menu driven program selection system 200 used with the present invention is to allow the subscriber to choose a program by touring through a series of menus utilizing a remote control 900 (Figure 3) or similar device providing cursor movement. The final choice in the series of menus will identify one particular channel and one time for activation of that channel. Armed with a channel and activation time, the set top terminal 220 can display the selected program on the television for the viewer. To achieve this goal one embodiment of the present invention assigns  
25 an intelligent alpha-numeric code to each program. This alpha-numeric code identifies the category of the program, the menu in which the program should be displayed, its transmission time(s), and the position on the menu that the program should be displayed.

In this embodiment, the program control information, including menu codes, is sent continuously from the operations center 202 to the network controller 214, and ultimately to the set top terminal 220. For example, four hours worth  
30 of programming information can be sent via the program control information signal continuously using the information shown in Tables A-C.

Table A shows the basic programming information that may be sent to the set top terminal 220. The program descriptions shown are coded abbreviations. For example, C for comedy, N for news, S for sports, A for cartoons, and TX for text. If there is a textual description for a program, such as a movie, the description may be given following that  
35 program's coded description or may be communicated following the four hours' worth of programming information. As is shown in the coded listing, program descriptions for programs greater than a half hour in length need not be repeated (each half hour). The video description code informs the set top terminal 220 of whether there is still or live video available to advertise the program.

For example, a sporting program may be assigned a code of B35-010194-1600-3.25-Michigan St. vs. USC. The letter B would assign the program to category B, sports. The second alpha-numeric character number 3 would assign the program to the third menu of the sports category. The third character of the code, number 5, assigns the program to the fifth program slot on the third menu. The next six characters, 01/01/94, represent the date. The following four characters, 1600 represent the start time which is followed by the length of the program and the program name. This entry represents a sports show, a college football game, which will be aired at 4:00PM on New Years day 1994.  
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TABLE B

Field #	Field	Type
1	Event Type 1 = YCTV™ 2 = Pay-Per-View 3 = Reg. TV	Unsigned Int
2	Event ID	Unsigned Int
3	Global Channel ID	Unsigned Int
4	Price (in Cents)	Unsigned Int
5	Start Time	HH:MM:SS
6	End Time	HH:MM:SS
7	Start Date	MM/DD/YY
8	End Date	MM/DD/YY
9	P-Icon	ASCIIZ
10	Name	ASCIIZ
11	Description	ASCIIZ

Table C shows an example Event Data file. In particular, Table C shows two data streams corresponding to two event types. The first data stream identifies a YCTV™ event in the first field. The second field designates the event ID, which is 1234 in this example. The third field includes the global channel ID number two. The fourth field indicates the cost of 50 cents for this event. The fifth and sixth fields indicate the respective start and end times of 3:00 a.m. to 3:00 p.m., respectively. The seventh and eighth fields show the corresponding start and end date, designated as 8/25/93 and 8/27/93, respectively. Field nine indicates the P-Icon set to PBS.PCX graphics file. Finally, fields ten and eleven indicate the name and description of the event selected, which in this case is Sesame Street and Barney. The second data stream in the Event.Dat example shown in Table C includes analogous information for Terminator IV, which is designated in field one as a pay-per-view event.

TABLE C

## Event Data Example

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```
1'1234'2'50'03:00:00'15:00:00'08/25/93'08/27/93'pbs.pcx'Sesame Street & Barney's Sesame Street and Barney
Abstract
2'1234'2'50'20:00:00'22:00:00'08/25/93'08/25/93'14.pcx'Terminator 4'Terminator 4 Abstract
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The program control information signal and STTCIS can be formatted in a variety of ways and the on-screen menus can be produced using different methods. For instance, if the program control information signal carries no menu format information, the menu format for creating the menus can be fixed in ROM at the set top terminal 220. This method allows the program control information signal to carry less information but has the least flexibility since the menu formats cannot be changed without physically swapping the ROM holding the menu format information.

In the preferred embodiment, the menu format information is stored at the set top terminal 220 in temporary memory, either in a RAM or EPROM. This configuration provides the desired flexibility in the menu format while still limiting the amount of information needed to be communicated through the program control information signal. New menu format information would be sent using the program control information signal or the STTCIS to the set top terminals 220 each time there was a change to a menu.

In the simplest embodiment, the menus remain fixed and only the text changes. Thus, the program control information signal can be limited to primarily text and a text generator can be employed in the set top terminal 220. This simple embodiment keeps the cost of the set top terminal 220 low and limits the bandwidth necessary for the program control



gramming availability, the signal processor 209 must combine the local signal in digital or analog form with the program signals 205 received from operations center 202. If a local cable system 200 uses a compression algorithm or standard that is different than the one used by the operations center 202, the signal processor 209 must also decompress and recompress incoming signals so they may be properly formatted for transmission to the set top terminals 220. In addition, the signal processor 209 performs any necessary signal decryption and/or encryption.

Figure 7 diagrams an alternative embodiment of a digital/analog cable headend 208. In particular, this embodiment includes decompression and recompression capabilities, showing the types of signal processing components that the network controller 214 may control. As shown in Figure 7, the cable headend 208 receiver front-end, indicated at 260, demodulates the received transponder signals 205, which may contain four, six, eight or more audio/video channels of information, into a digital bit stream of multiplexed digitized MPEG or MPEG 2 format video. The signal processor 209 receives the multiplexed signals and initially performs any demultiplexing required to process the received signals. The demultiplexers 242 separate the multiplexed signals into separate individual MPEG or MPEG 2 format digital channels. Depending on the transponder signal received, the demultiplexer 242 may have four, six, eight or more cross connects to the combiner 264. The outputs of the demultiplexers 242 are selectively enabled by the control CPU 244. Those outputs of the multiplexer 248 that are enabled are then input to the combiner.

Decrypting may be necessary and can be conducted by a separate decrypting device 262 included as part of the signal processor's internal components. The signal processor's control CPU 244 may be controlled by a remote site (such as a national site) via a modem or similar connection 266. Therefore, the remote site is able to control the output of the demultiplexers 242. Alternatively, instead of enabling the outputs of the demultiplexers 242, the inputs of the combiner 264 may be selected by the control CPU 244. By enabling or selecting multiplexer 248 outputs, the control CPU 244 is able to control which television programs are combined and transmitted to the viewers.

The combiner 264 combines the enabled or selected outputs of the demultiplexers 242 into the proper format and outputs the signals through a compressor 268, and an encryptor 270 (if desired), to a digital modulator 272. The modulator 272 outputs a modulated RF carrier combined with other carriers onto the cable distribution network 236. The set top converter terminals 220 in subscribers' homes select and demodulate a particular channel selected by the user. As selections are made, the set top terminal 220 stores the programs accessed in its local storage for later transmission to the network controller 214 at the cable headend 208.

##### 5. Changing Menu Content by Modifying the Program Control Information Signal

Figures 8a through 8c are sample menu screens produced by a set top terminal 220 using the program control information signal. Figure 8a shows a menu which enables the viewer to select a program category from among a choice of eight program categories 1048. Figure 8b shows a menu 1050 for the viewer to select a hit movie from among ten hit movies 1052. Figure 8c depicts a menu 1054 which provides information about a movie and enables a viewer to order the movie for viewing.

Figures 8a through 8c show text generated by a set top terminal 220. This text is generated using information received via the program control information signal by a text generator (not shown) in the set top terminal unit 220. Those portions of the text that generally remain unchanged for a period of weeks or months may be stored in EEPROM or other local storage. For example, the text "HIT MOVIES from" 1056 will consistently appear on each hit movies' major menu. This text may be stored on EEPROM or other local storage. Further, text such as that which appears at the lower center part of the screen "PRESS HERE TO RETURN TO CABLE TV" 1058 appears many times throughout the menu sequence. This text may also be stored locally at the set top terminal 220.

Text which changes on a regular basis, such as the movie titles 1052 (or other program selections), will be transmitted to the set top terminal 220 by either the operations center 202 or the cable headend 208. In this manner, the cable headend 208 may change the program selections available on any menu by modifying the program control information signal sent by the operations center 202 and transmitting the change.

It is preferred that the text, e.g., 1048, 1052, 1056, etc., be generated by the set top terminal 220 separately from the graphics because the text can be stored locally in a more compact manner requiring less storage space at the set top terminal 220. In addition, it allows for easy communication of text changes from the operations center 202 or cable headend 208 to the set top terminal 220.

Figures 8a through 8c show the use of day, date and time information 1060 on menus. This information may be obtained in a varied of ways. The day, date, and time information 1060 may be sent from the operations center 202, the cable headend 208 (signal processor 209 or network controller 214), the uplink site 204, or generated by the set top terminal unit 220 internally. Each manner of generating the day, date, and time information 1060 has advantages and disadvantages which may change given the particular embodiment and costs.

In the preferred embodiment, the day, date, and time 1060 are generated at a central location such as the operations center 202 and are adjusted for regional changes in time at the cable headend 208. In particular, the network controller 214 modifies the PCI signal to accommodate regional day, date and time information and changes and additions

stream distribution. As described above, digital signals are also combined using the RF combiner 290 and disseminated over the cable network. Upstream transmissions are accomplished as described above in conjunction with the discussion for Figure 9a.

Upstream information received from the set top terminals 220 typically includes, for example, program access data gathered at each set top terminal 220. Such information may be communicated to the network controller 214 through a variety of methods including any of the following methods: (1) cyclic polling, (2) random access, and (3) telephone modems. Cyclic polling and random access methods make use of the two-way RF system diagrammed in Figures 9a and 9b, described above.

As described below, the preferred embodiment employs a cyclic polling method. Although various polling schemes will work with the present invention, a roll-call polling scheme is preferred over other schemes such as hub polling or token-passing since roll-call polling provides the greatest degree of centralized control.

Using this preferred method, program access information is stored at each set top terminal 220 until it is polled by the network controller 214 for information retrieval using a polling request message format 920 as shown in Figure 10a. This frame format 920 may include such program control information as shown in Tables A-C above, typically consisting of six fields: (1) a leading flag 922 at the beginning of the message, (2) an address field 924, (3) a subscriber region designation 926, (4) a set top terminal identifier 928 that includes a polling command/response (or P/F) bit 930, (5) an information field 932, and (6) a trailing flag 934 at the end of the message.

The eight-bit flag sequence that appears at the beginning and end of a frame, 922 and 934, respectively, is used to establish and maintain synchronization. Such a sequence typically consists of a "01111110" bit-stream. The address field 924 designates a 4-bit address for a given set top terminal 220. The subscriber region designation 926 is a 4-bit field that indicates the geographical region in which the subscriber's set top terminal 220 is housed. The set top terminal identifier 928 is a 16-bit field that uniquely identifies each set top terminal 220 with a 15-bit designation followed by an appended P/F bit 930. Although field size is provided by this example, a variety of sizes can be used with the present invention.

The P/F bit 930 is used to command a polling response from the set top terminal 220 addressed, as described below. The frame format 920 also provides a variable-length information field 932 for other data transmissions, such as information on system updates. The frame format 920 ends with an 8-bit flag 934 (or trailing flag) that is identical in format to the leading flag 922, as set forth above. Other frame formats will be apparent to one skilled in the art and can be easily adapted for use with the system.

Using any such polling request message format 920, the network controller 214 interrogates each set top terminal 220 sequentially, one by one. In this type of access strategy, the network controller 214 is designated as the central controller of the cable distribution network 200 and is responsible for control of the communications links between itself and the set top terminals 220. This control includes issuing commands to the set top terminals 220 and receiving responses back from the set top terminals 220.

Basically, the network controller 214 instructs the signal processor 209 to transmit to each set top terminal 220 a polling request, which asks whether a set top terminal 220 has any information to transmit. The set top terminals 220 are identified by the unique address and set top terminal identifier 928. It is preferred that the set top terminal 220 transmit information and messages to the network controller 214 only when given permission by the network controller 214 to do so.

Where, for example, specialty programs have been accessed since the previous poll, the set top terminal 220 is given permission to transmit a polling response in the form of a status report that includes any such access information. The network controller's control receiver 228 is tasked with the receipt of set top terminal 220 polling responses or status reports. These status reports generally include information that allows the network controller 214 to track a subscriber's program access history. As described above, the control receiver can store the status reports locally and/or transfer them to the network controller CPU 224.

The network controller CPU 224 immediately processes each polling response as it is received from each set top terminal 220. The network controller CPU 224 updates pertinent databases 226 with the received information, and then sends another polling request to the next set top terminal 220 on its list. A set top terminal 220 with no information to transmit so indicates in a reply to the network controller 214. Once all set top terminals 220 have been given permission to transmit status reports, a cycle is complete and a new cycle begins.

Through a polling cycle, the network controller 214 acquires the information needed to operate the system 200. During the cycle, the network controller 214 sends signals to the set top terminals 220 to authorize both their operation and access to specific channels. If, for example, a subscriber has failed to pay a recent bill, the network controller 214 can deauthorize the subscriber's set top terminal 220. Likewise, when a subscriber orders a program or channel, the network controller 214 checks the subscriber's account for good standing by reading the proper database file. After the check, the network controller 214 then either authorizes or deauthorizes access by the set top terminal 220 using the data transmitted in a modified program control information signal. As a result, the cycle requires a series of requests and responses to operate.

Processing is accomplished by the network controller CPU 224. Operator instructions are input to the network controller CPU 224 through the operator control station 234 that includes, for example, a computer/workstation with a CRT display, printer and other peripherals. Multiple operator control stations 234 can be used to assist in control operations.

Regional operator control stations (not specifically shown, but substantially identical to stations 234) may be used and may include multiple operator control stations each assigned to a particular subscriber region corresponding to a geographic region where set top terminals 220 are located. Thus, each regional operator control station is assigned to a subscriber region, providing monitoring and control capabilities over such regions. All regional program control information is transferred to the network controller CPU 224 for processing, as in the case where a single control station 234 is used. Likewise, during this processing, portions of the network control databases 226 may also be updated.

No set number of databases 226 are required for the network controller 214 to perform its operations, and a single temporary database may be used. In the preferred embodiment, however, the network controller 214 uses several databases (indicated at 226) that are accessed during network control operations. These databases 226 are identified in Figure 11 and include: (1) the Viewer Profile database 314, (2) the Account/Billing database 316, (3) the Program Library database 318, (4) the Program Scheduling database 320, (5) the Advertisement Library database 322, and (6) the Advertisement Scheduling database 324.

Figure 12 shows one example of a network controller's basic database structure including the databases identified in the preceding paragraph. The data stored in these databases is not simply raw data. Rather data may be processed, correlated and appropriately indexed to create a true relational database 226.

As shown in Figure 12, the Viewer Profile database 314 includes: (i) a Set top ID File, (ii) a Subscriber Region File, (iii) a Customer ID File and (iv) a Viewer Log File, the latter three files being indicated generally as a file group 332. The Set top ID File 330, common to each of the databases comprising the network controller's database 226, contains set top converter records with each record representing a unique set top terminal 220. Examples of information stored in this file includes set top terminal type, software version and set top terminal identification/serial number. The Set top ID File 330 contains the key data that links each relational database with one another, as described below.

The Subscriber Region File, part of file group 332, includes information such as headend 208 assignment, regional operator control workstation assignment and a designation for the subscriber's geographical area. The Customer ID and Viewer Log Files, part of file group 332, include the subscriber's personal information, such as name, address and telephone number, and information on the subscriptions to cable services for each customer as well as a personal profile for each viewer, respectively.

The personal profile consists of demographic information that may be gathered in a number of ways. The set top terminal 220 builds the personal profile for each viewer and stores the information in a memory file by viewer name. To build a personal profile in the preferred system, the viewer answers a series of questions presented on a series of menu screens. These personal profile screens request the viewer to input information such as name, sex, age, place of birth, place of lower school education, employment type, level of education, amount of television program viewing per week, and the number of shows in particular categories that the viewer watches in a given week such as, sports, movies, documentaries, sitcoms, etc. Any demographic information which will assist the set top terminal 220 in targeting advertisements to the viewer may be used.

In addition to gathering demographics at the set top terminal 220, the personal profile can be compiled using other methods. For instance, the information can be gathered using questionnaires sent by mail and subsequently entered in the Viewer Profile Database 314 by the network controller's control station operator.

As an alternative to gathering demographic data, a simulated profile can be generated using an algorithm similar to that described below that analyzes access history and viewing habits. Using test information generated from a statistically significant number of viewers, the simulated profile algorithm estimates the viewer's age, education, sex and other relevant information. The analysis requires reviewing the viewer's programs watched and statistically comparing the viewer's programs watched with the test group. Also, the algorithm can place the subscriber or viewer in a viewer category. This analysis is transparent from the subscriber's point of view and attempts to accurately profile the viewer. Various viewers or viewer categories can later be targeted with different advertisements.

The Account/Billing database 316 includes (i) the Set top ID File 330, and (ii) an Account History File, and (iii) a Billing File, the latter two files indicated at 338. The Set top ID File, as described above, contains information unique to each subscriber, including set top terminal type, software version and set top terminal identification/serial number. The Account History and Billing Files contain information concerning each subscriber's past bills and account record and information on the most recent bill, including data from which the next billing report can be generated, respectively.

The Program Library database 318 include (i) the Set top ID File 330, and (ii) a Programs File, (iii) a Preview File, (iv) a Program Category File, (v) a Price Category File and (vi) Service File, the latter five files identified at 344. As usual, the Set top ID File identifies each set top terminal 220 by identification number. The Programs File contains information on every program offering in the system, including name, length and type of program. The Preview File contains information on previews for specialty programs stored in the Programs File. The Program Category File contains a set of categories into which each program may be placed, such as movies, sports, science fiction and news. The Price Cat-

routine (or sequence) is initiated, block 384, automatically by the network controller CPU 224 upon receipt of the program control information (PCI) signal from the signal processor 209. Once the network controller 214 receives the PCI signal, the network controller CPU 224 begins processing the signal by reading the PCI data carried by the signal, block 386.

5 After reading the PCI data, the network controller CPU 224 "calls" other routines to interactively process data and continue the modification process for each set top terminal 220. First, the network controller CPU 224 calls the Polling Cycle routine 372, at block 388, in order to request data retrieval of the information stored at individual set top terminals 220. Such information includes data on the programs accessed and those ordered for later viewing. As polling responses are received from the set top terminals 220, the network controller CPU 224 next calls, block 390, the Advertisement Targeting routine 374, which generally arranges groupings of commercials for different subscribers based, in part, on viewer demographic information and program access history.

The network controller CPU 224 next calls 392 the Account/Billing routine to begin processing all programming and channel access requests. The Account/Billing routine determines, among other things, whether the subscriber's account is in good standing, verifying that past bills have been paid and that access authorization is warranted. Upon completion of this verification process, a verification message will be sent to the network controller's operator control station 234 indicating that access should be granted.

In the preferred embodiment, an access authorization code may automatically be processed by the network controller CPU 224 and appended to the PCI signal originally received from the signal processor 209. This modified PCI signal and access authorization code will then be transferred back to the signal processor 209 for transmission to the set top terminals 220.

20 With continued reference to Figure 14, in an alternate embodiment that uses the Modifying PCI Routine 370, at blocks 394 and 396, the operator manually enters any changes in programming and menu content, along with access authorizations, into the program scheduling database 320. The manual entry of programming and menu content in this embodiment, blocks 394, 396, requires that the operator access the database information generated and updated by the other routines and make necessary changes in the program scheduling database. The network controller CPU 224 reads this updated database information, generates a modified PCI signal, and sends, block 398, the signal to the signal processor 209.

If a subscriber account is delinquent, access to any new programs or channels ordered will not be authorized. Instead, the network controller CPU 224 will deny authorization and generate a deauthorization message to be included in the PCI signal that will be returned to the signal processor 209 for transmission to the set top terminals 220. Alternatively, the network controller CPU 224 generates a delinquency message that is transferred to the CRT display at the network controller's operator control station 234. Upon reviewing the message, the operator may then manually enter message text to be included in the PCI signal that informs the subscriber of a delinquent account.

#### 35 10. Polling Cycle Routine

Figure 15 shows a software flow diagram for the network controller's Polling Cycle routine 372, which iteratively executes the network controller's polling cycle. The number of iterations correspond to the number of set top terminals 220 being polled. The network controller CPU 224 initiates the Polling Cycle sequence periodically on a predetermined basis, block 400. Typically, this period is set by the operator at the network controller's operator control station 234 at once per day, although other periods (e.g., multiple times per day or once per week) can be used. Upon initiation of the sequence 400, as depicted at function block 402, the network controller CPU 224 reads the Set top Terminal ID File 330 and begins generating, block 404, a polling request frame (shown in Figure 10a and described herein above) for the first set top terminal 220 identified in the file 330. Once the necessary polling request information is complete, the frame is transferred to the signal processor CPU 244 through the interface between the signal processor 209 and network controller 214. After transfer to the signal processor 209, the frames may be transmitted to the set top terminals 220, block 406. Meanwhile, the network controller's control receiver 228 awaits the corresponding response.

Upon receipt of a polling response, as depicted at block 408, the network controller CPU 224 reads the received information from the control buffer 315. The network controller 214 reads the information field of the polling response frame format, as described above. The network controller CPU 224 processes, indexes and stores the data in an appropriate format, updating the corresponding database files with the information received, block 410. The processing and indexing of the raw data into a relational database 226 is important to the ability of the network controller 214 to quickly take actions such as targeting commercials without lengthy processing time. The polling routine subsequently returns to the Set Top Terminal ID File 330, as shown at decision block 412, to continue the polling cycle for the next set top terminal 220 identified in the file 330. When the routine 372 sequences through the last set top terminal 220, the cycle is complete and the routine 372 ceases until the next polling period.

Most often, the files that require updates during the polling cycle are the Access History File and the Programs Watched Matrices File, both indicated generally at 350 in Figure 12, and the Account History File 338. For example, Fig-

sequently be assigned a number of times that it will be shown in a given timeframe, block 446. This frequency of display may be based on various factors, including the number of requests and cost paid by the respective advertisers to have the commercial displayed. Such factors are used in the next step of the subroutine, block 448, which assigns a weighting to specific commercials or advertisements in each advertisement category or group. These weightings are used to prioritize the advertisements that will be sent to individual set top terminals 220 or nodes of set top terminals 220.

Once the advertisements have been weighted, the software executes its correlation algorithm, 450, using selected criteria (i.e., the various factors used to weight the advertisements) as well as the output of each programs watched matrix. Any number of correlation algorithms and weighting algorithms may be used with the software, including the sum of squares weighting algorithm described above.

The results from the correlation algorithm subsequently determine the advertisements and programming material that is sent to the signal processor 209 for distribution over the cable network, as represented at block 452. Once the subroutine 428 completes these steps, the network controller CPU 224 updates the account and billing database based on the ads that are sent to the signal processor 209 for subscriber viewing, as shown at block 454. These billing database updates allow the advertisers to track the costs and frequency of the advertisements targeted to specific set top terminals 220 or nodes of set top terminals 220. Following the updates, the subroutine returns to the advertisement targeting sequence shown in Figure 17, block 456.

Referring to Figure 20a, set top groupings (A through E) 460 are shown. The number of set top groupings available is determined by the bandwidth available to transmit commercials. The bandwidth of the system will limit the number of commercials which are available at the set top terminal 220 at any given time.

Referring back to Figure 17, the fifth subroutine, represented at function block 466, prepares set top group information for transmission to the set top terms 220. This subroutine 466 modifies the PCI signal and includes set top group information in the information field of the frame format given earlier. The various methods for transmitting the group information to the set top terminals 220 are described below.

The sixth subroutine, block 468, selects the target video and is the last decision making process in targeting a commercial for a viewer and, can be performed by either the set top terminal 220 or the network controller 214. In the preferred embodiment, the set top terminal 220 performs this last step by correlating (or matching) the program being watched by the viewer with the set top group information that has been previously transmitted by the network controller 214, and the targeted video is then displayed, as shown at block 470. Figure 20a shows an exemplary table matching set top terminal groups 460 and program category being watched 470 with a specific channel (continuously) showing commercials. The commercial channels are shown in Figure 20b at 474 and are assigned Roman numerals I through X, for example. The number of set top groupings and channels showing commercials can vary. Figure 20b shows a division of available bandwidth to carry ten videos, ten commercial channels. In this example, the channels 474 are numbered 101-110.

The network controller 214 will transmit group information to a set top terminal shown as row names 460 on Figure 20a. The network controller 214 will also transmit data which informs the set top terminal 220 which of the multiple commercial channels 474 is assigned to a television program category shown as Columns 470 on Figure 20a. Each set top terminal 220 only requires the data related to that set top terminal's assigned group (or row). For example, in Figure 20a, the set top terminal in group A (row A) is provided with data on the commercial channel which are assigned for sports programs as I, children's programs as IV and movie category as III. In this manner, each set top terminal 220 is only required to store information related to its own grouping. Therefore, a set top terminal 220 which is in group A only needs to store the information related to group A, which is found in row A of Fig. 20a. This information includes one commercial channel assignment for each of the eight program categories. Using this information, the set top terminal 220 first determines the category of the television program currently being watched and then is able to quickly determine which channel to switch the viewer when an advertisement availability occurs during the program.

The network controller 214 can also perform the step of correlating program category watched 470 and set top terminal grouping 460 to select the target video. In order for the network controller 214 to perform this function, it must have information on the program currently being watched by the viewer. To obtain this information in a polling system, set top polling must occur on a real-time basis (i.e., 10 minutes).

During the target commercial selection process, the set top terminal programming will default to the existing commercial during a program if it is missing any of the information needed to determine which of the continuously playing commercial channels to show. In alternative embodiments, the default that is shown on the regular programming channel will correlate with one of the assigned set top groupings and program categories. Figure 20a shows, at 478, that the default has been assigned to set top terminal grouping C for program categories "children" and "entertainment."

The three preferred methods to transmit targeted commercials to a set top terminal 220 are: (1) the Additional Bandwidth method (or individual video access); (2) the Multiple Channel method, and (3) the Split Screen method. Each method has certain advantages and disadvantages. The Additional Bandwidth method allows the most flexibility by more specifically targeting commercials before the commercials are transmitted to a set top terminal 220. However, it requires a great deal of available bandwidth in the delivery system. This is difficult with a cable system 200 but possible

may include: (1) Household Goods/Products, (2) Home Improvement and Maintenance, (3) Personal Hygiene, (4) Entertainment Items and Events, (5) Sporting Goods and Events, (6) Motor Vehicles and Related Products, (7) Foodstuffs and Beverages, and (8) Miscellaneous. Where, for example, the viewer has watched a sporting event, the Sporting Goods and Events, Home Improvement and Maintenance, and Foodstuffs and Beverages categories may be assigned to that particular sporting event/program and Sports program category.

Once the programs and program categories ranked in the Viewer Log File are correlated with the advertisement categories in the Advertisement Categories File, the routine calls a sorting subroutine that ranks the groups of advertising categories correlated based on other information in the database files. In the preferred system, this ranking is primarily based on data in the updated Access History File and the updated Viewer Log File, as shown at function block 506. By using data on the viewer's past program selections and demographic information, the subroutine ranks the correlated categories of advertisements according to those likely to be of most interest to that viewer.

After the advertisement categories have been sorted and ranked, the routine selects the top three advertisement categories as the targeted categories for a given time slot and viewer, block 508. Individual advertisements are then chosen from the Advertisements File, with all selections made from the targeted categories, 510. The advertisements that are selected are written to the Advertisement Targeting File from where advertising packages can be generated, function 512, for transmission to the set top terminals 220. Such packages are generated by the network controller CPU 224, which accesses the Advertisement Targeting File and includes the targeted advertisements in the PCI signal. The entire routine is repeated for each set top terminal 220 and, alternatively, each viewer.

### 13. Account/Billing Routine

Figure 22 shows a software flow diagram for the network controller's Account/Billing routine 376, initiated automatically at block 520 by the network controller CPU 224 upon receipt of each polling response from a set top terminal 220. Upon receipt of such a response, the network controller CPU 224 identifies the set top terminal identifier from the polling response, block 522. The program access block in the polling response is also read, function 524, and the Access History File is updated with the received information, function 526. The routine then calls a subroutine that correlates the updated information in the Access History File with the Price Category File in the Program Library database, block 528. Once all programs accessed since the last polling cycle are assigned to a price category, the pricing information from each category is written to the Account History File, updating the file at 530. The network controller CPU 224 generates a billing report for each set top terminal 220 based on the updated account history, function 532. This billing report can be sent to the set top terminals 220 in a polling request. Specifically, in one embodiment, the information field of the frame format described in Figure 9a is used to provide the set top terminal 220 with billing information.

Account information for each set top terminal 220 can be viewed through a monthly account review menu. The account information necessary to create the monthly account review menus may be stored either in the memory of the set top terminal 220 or at a remote location that communicates with the set top terminal 220. In the simplest embodiment, the set top terminal 220 records a subscriber's selections locally and calculates the monthly account review based upon the subscriber's selections which require the payment of fees. This monthly account information is stored locally and sent to the network controller 214 upon polling.

The Account/Billing routine is capable of processing account and billing information generated in other embodiments. For example, in an alternate embodiment, the subscriber's viewing selections and billing information may be continuously maintained at the network controller 214 or a remote site connected via communication lines to the cable headend 208. The network controller 214 or the remote site must regularly transmit the monthly account information to the set top terminal 220.

Each embodiment, such as local billing storage at the set top terminal 220, billing by the network controller 214 or billing by a remote site, has advantages and disadvantages. If the account information and processing is done locally at the set top terminal 220, each set top terminal 220 must be provided with the memory and necessary processing capability to maintain the account. This greatly increases the cost of a set top terminal 220. If the account information is maintained remotely, the remote site must remain in regular contact with the set top terminal 220 in order to provide the subscriber with billing information. To accommodate homes with multiple viewers two or more set top terminals 220 may be placed on a single bill or two accounts may be created for one set top terminal 220.

Figure 23 shows another embodiment in which billing may be accomplished through the use of remote statistical and billing sites (SBS). In this arrangement, statistical and billing information from individual communities of set top terminals 1750 is communicated through cable headend sites to regional statistical and billing sites 1730 (SBS). A regional SBS may serve several cable headend sites, shown at 1732. The regional SBS 1730 calculates billing and statistical information and passes necessary billing information back downstream through the network controller 214 at the cable headend 208 to an appropriate single set top terminal 220 in a subscriber's home. In addition, the regional SBS 1730 communicates the billing and statistical information received on program viewer choices to the central SBS 1740.

The central SBS 1740 accumulates the data received from a number of regional statistical and billing sites and cal-



a display, wherein switching to the selected channel is transparent to the viewer.

9. The apparatus of claim 7, wherein the receiver also receives insert directions which instruct a set top terminal to insert video corresponding to the selected advertisement; and further including:

a memory, wherein the memory stores the video corresponding to the selected advertisement.

10. The apparatus of claim 1, wherein the gathering means and processor are located in any of a cable headend, a network controller and an operations center.

11. The apparatus of claim 10 further including a transmitter, wherein the transmitter transmits the selected advertisement.

12. The apparatus of any of claims 1 to 11, wherein the analysing means determines frequency programs watched by the subscriber or viewing habits of the subscriber.

13. The apparatus of claim 12, wherein the analysing means creates a viewer file.

14. The apparatus of claim 12 or 13, wherein the frequency of programs watched by the subscriber are arranged in at least one programs watched matrix.

15. The apparatus of claim 14, wherein the programs watched matrix is arranged by program category and time slot and the analyzing means includes:

a means for reading the programs watched matrix; and

a means for sorting programs watched counts within a time slot from highest to lowest.

16. The apparatus of any of claim 1 to 15, wherein the correlated advertisement is a category of advertisements and the category of advertisements includes at least one advertisement.

17. The apparatus of claim 16, wherein the category of advertisements includes at least one promotion or at least one infomercial.

18. The apparatus of any of claims 1 to 17, wherein the correlated advertisement is an infomercial or a promotion.

19. The apparatus of any of claims 1 to 18, wherein the gathering means gathers programs watched data from a plurality of subscribers and the processor processes the programs watched data gathered from the plurality of subscribers.

20. The apparatus of any of claims 1 to 19 further including:

means for developing a program line-up based on the analyzed programs watched data, wherein the program line-up includes advertisements; and

means, operably connected to the developing means, for transmitting the program line-up to the subscriber.

21. The apparatus of claim 20 further including:

means for gathering marketing data; and wherein the analyzing means also analyzes marketing data.

22. The apparatus of any of claims 1 to 21 further including:

memory, operably connected to the processor, wherein the memory stores at least one program for selection; and

means, operably connected to the memory, for choosing at least one stored program based on the analyzed data.

a means for gathering demographic data from subscribers; and  
wherein the means for correlating also uses the gathered demographic data.

5 33. The apparatus of claim 32, wherein a first group of subscribers forms a statistically significant number of subscribers, the means for gathering demographic data gathers demographic data from the first group of subscribers, the means for gathering programs watched data gathers programs watched data from the first group of subscribers and a second group of subscribers, and the apparatus further includes:

10 a means for generating a simulated demographic profile of the second group of subscribers by comparing the programs watched data of the second group of subscribers with the gathered demographic data and the programs watched data of the first group of subscribers.

34. The apparatus of claim 1, wherein the processor further includes:

15 a means for counting the gathered programs watched data to determine frequency of programs watched by the subscribers wherein the programs watched counts are arranged in at least one programs watched matrix by program category and time slot; and  
a means for creating subscriber group information indicating a group assignment for each subscriber by correlating the programs watched counts with at least one advertisement; and  
20 wherein the transmitter transmits the subscriber group information in a control information stream.

35. The apparatus of claim 34 further including:

25 a set top terminal wherein the control information stream instructs the set top terminal in selecting advertisements for display during viewing of programs.

36. An apparatus for data processing related to program advertisements comprising:

30 a receiver for receiving data, wherein viewer profile data is received from at least one remote location;  
a first memory location, operably connected to the receiver, wherein at least one advertisement is stored;  
a second memory location, operably connected to the receiver, wherein data on viewer profiles are stored; and  
35 a central processing unit, operably connected to the first and second memory locations, wherein at least one advertisement and the viewer profile data are processed, and at least one advertisement is scheduled.

40 37. The apparatus of claim 36, wherein the receiver, a first memory location, second memory location, and central processing unit are in any of a set top terminal, an operation center and a cable headend.

38. The apparatus of claim 36 or 37 further including:

45 a third memory location, operably connected to the central processing unit, wherein programs watched data is stored; and  
wherein the central processing unit processes the viewer profile data and programs watched data to schedule at least one advertisement.

39. The apparatus of any of claims 1 to 38, wherein at least one advertisement is a promotion or an infomercial.

50 40. The apparatus of any of claims 1 to 39, wherein at least one advertisement includes information on advertisements but not video corresponding to the information on advertisement.

41. The apparatus of claims 1 to 40, wherein at least one advertisement includes information on advertisements and video corresponding to the information on advertisements.

55 42. The apparatus of claim 41, wherein the information on advertisements identifies an infomercial or a promotion.

43. The apparatus of claim 42, wherein the information on advertisements identifies the individual advertisements by



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58. The method of claim 57, wherein the step of switching is transparent to the viewer.

59. The method of any of claims 47 to 58 further including the step of:

5       storing at least one program for selection at a remote location;  
      choosing at least one stored program based on the analyzed data; and  
10       transmitting at least one chosen program from the remote location to the subscriber.

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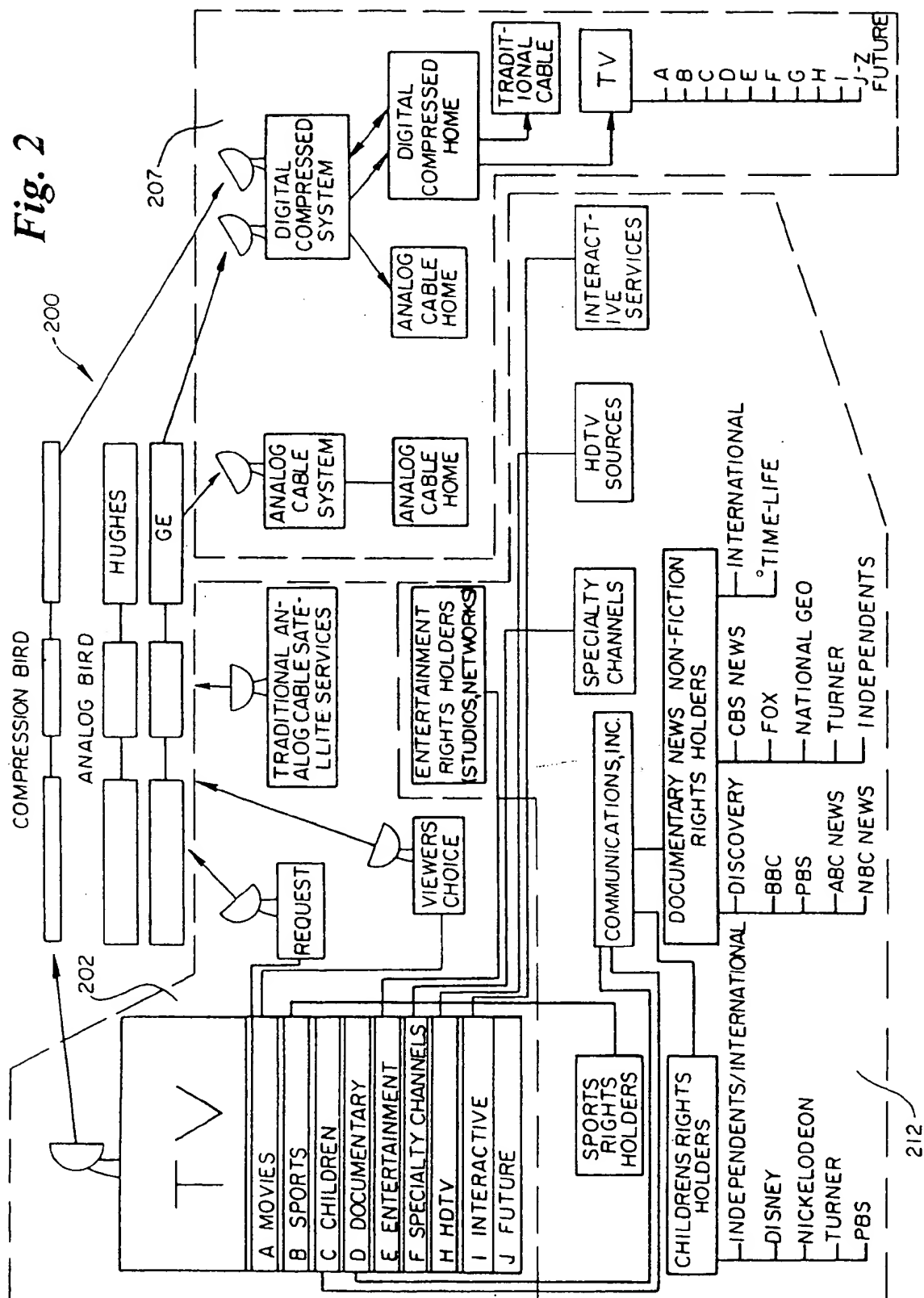
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**Fig. 2**



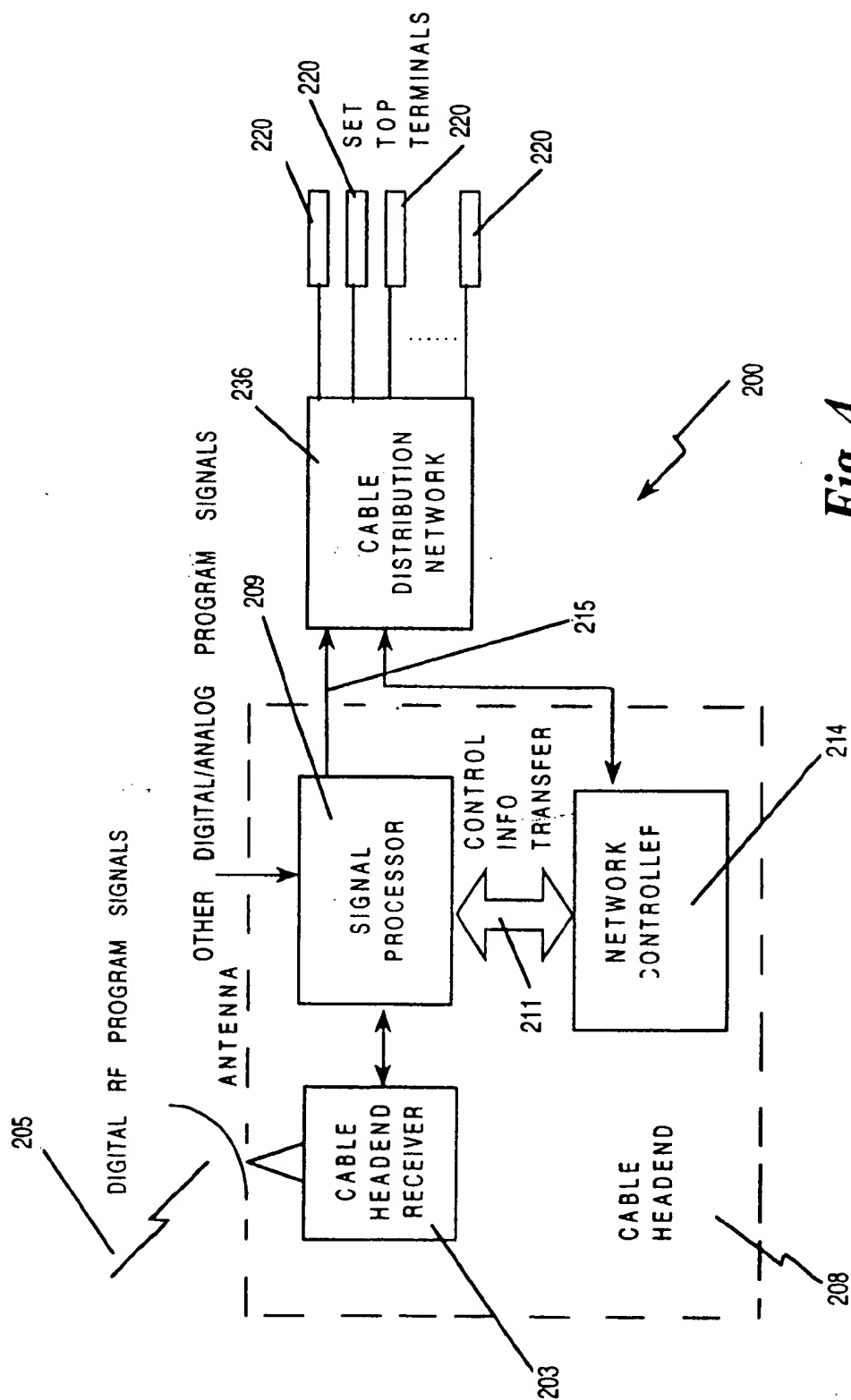


Fig. 4

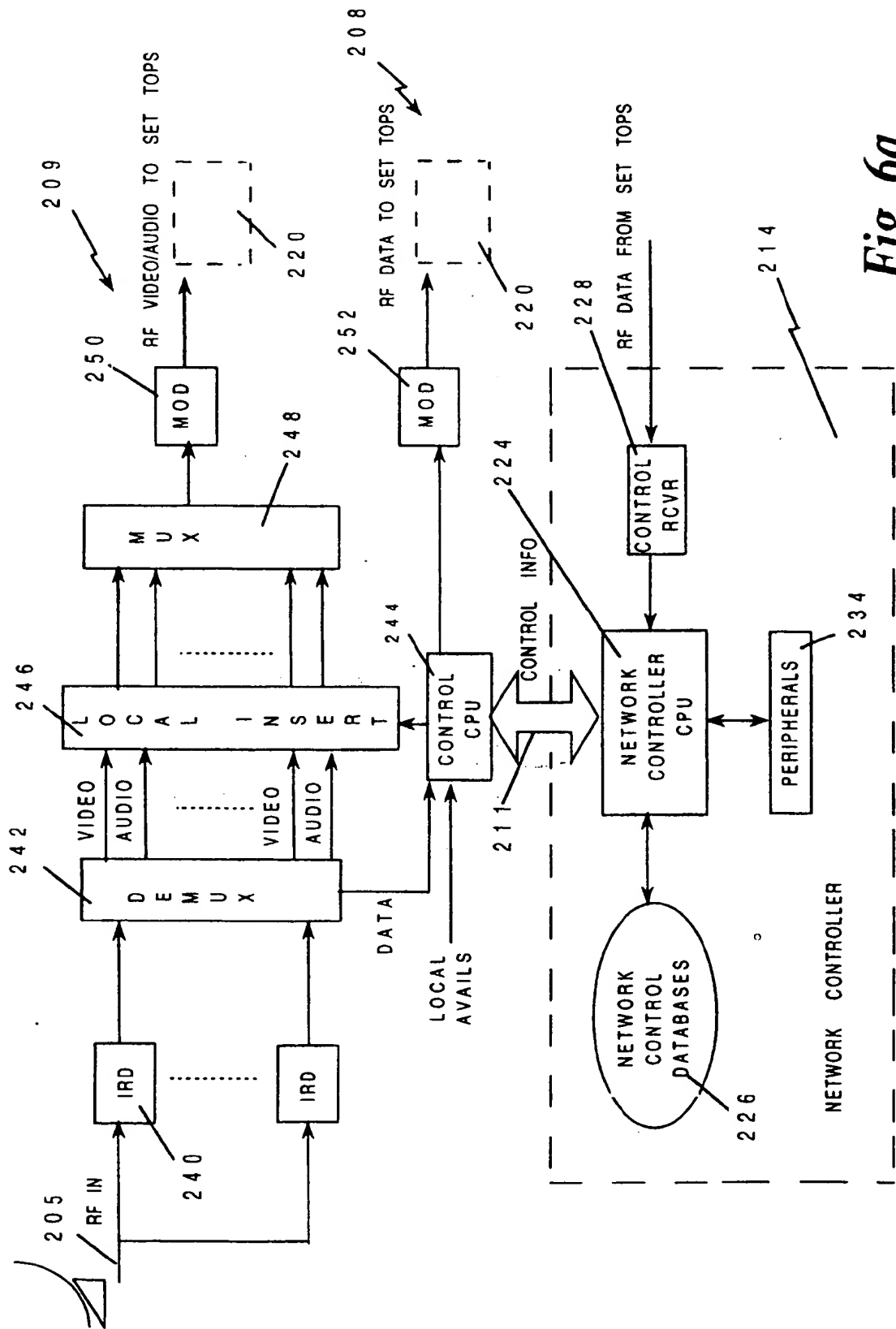
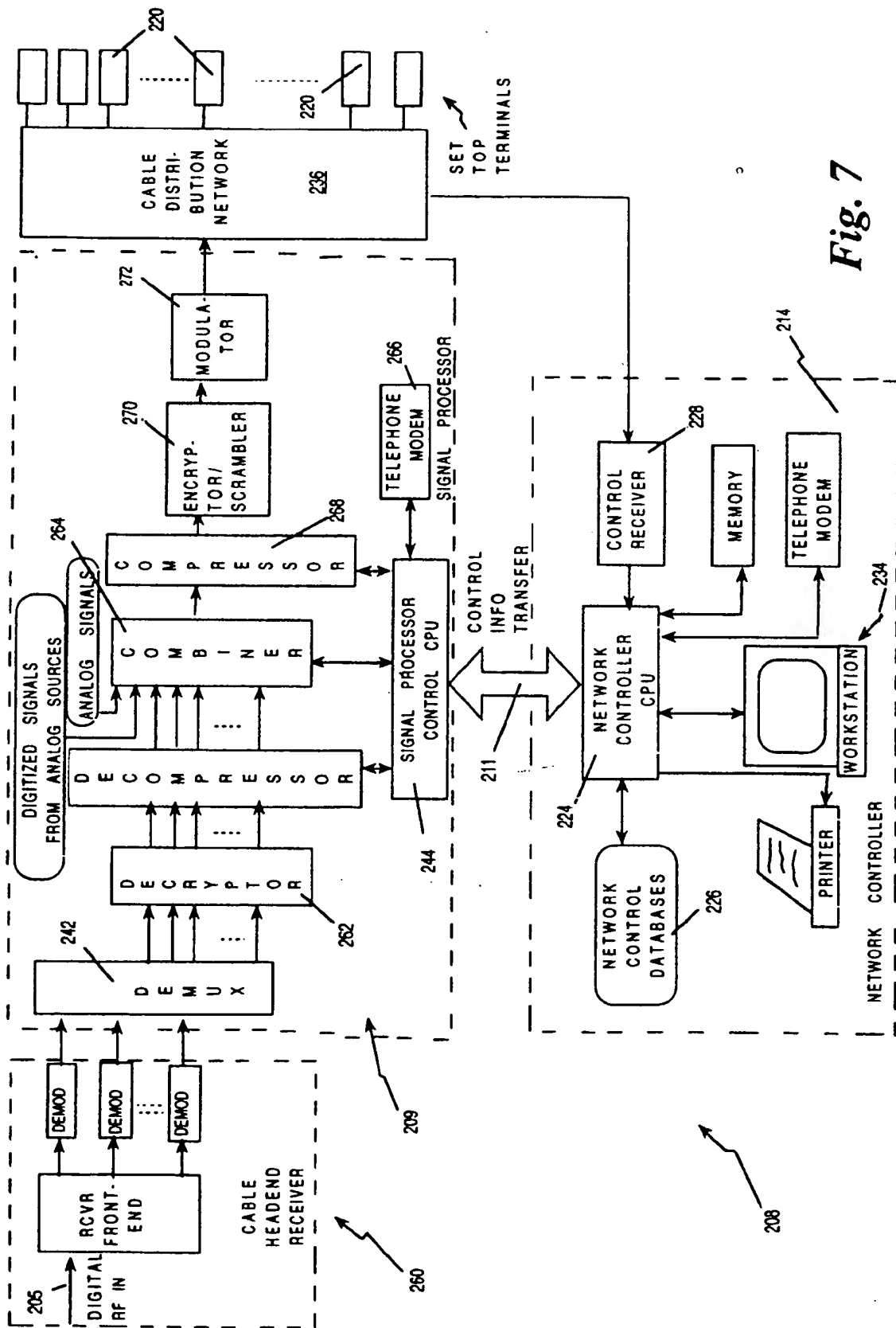
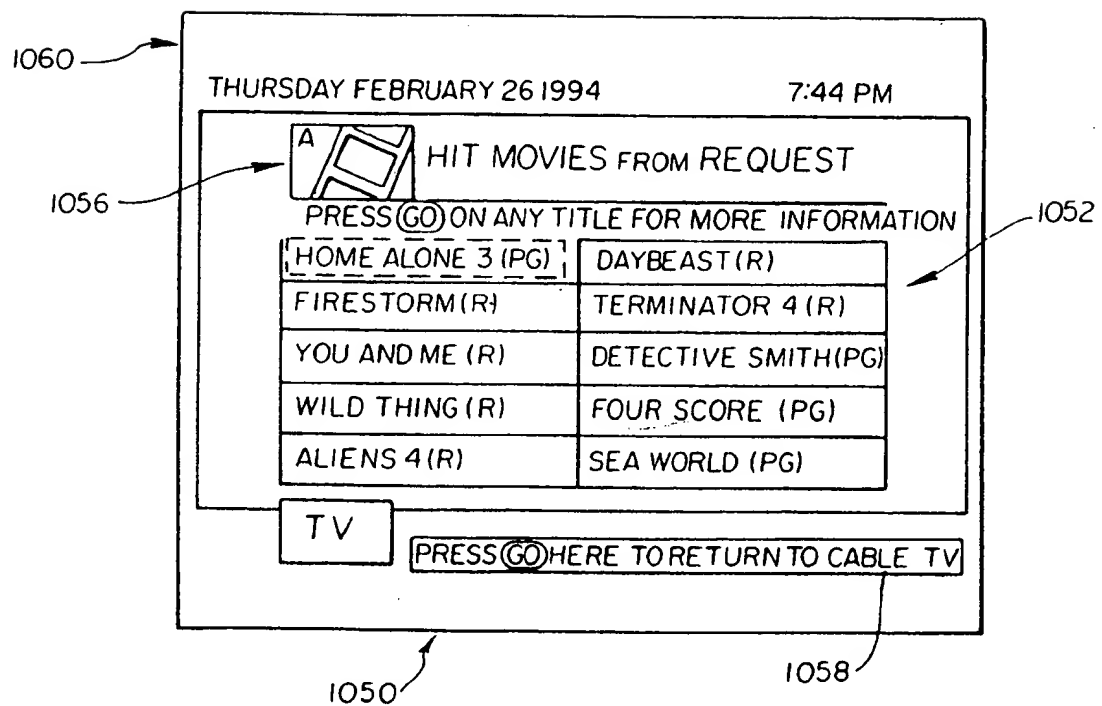
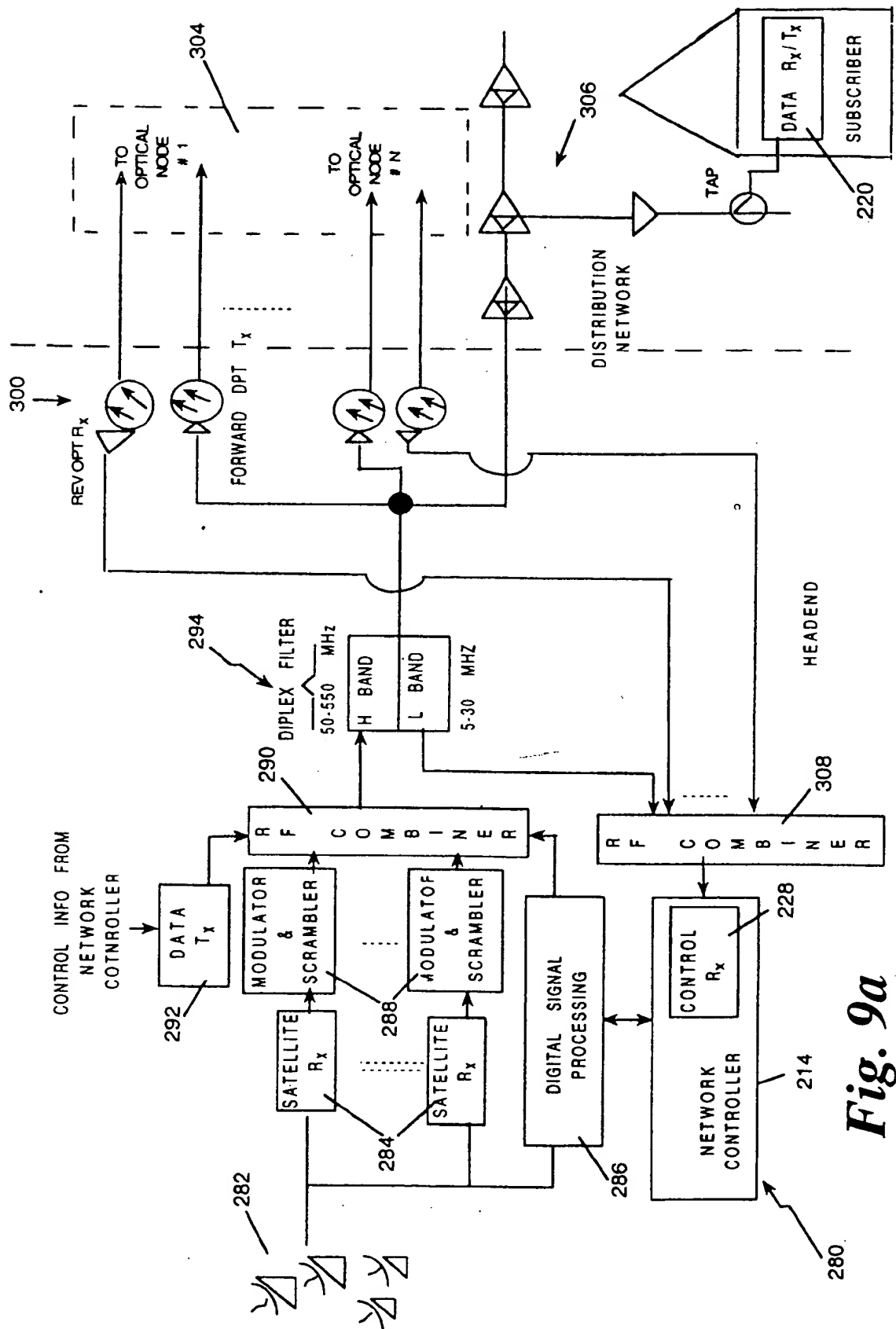


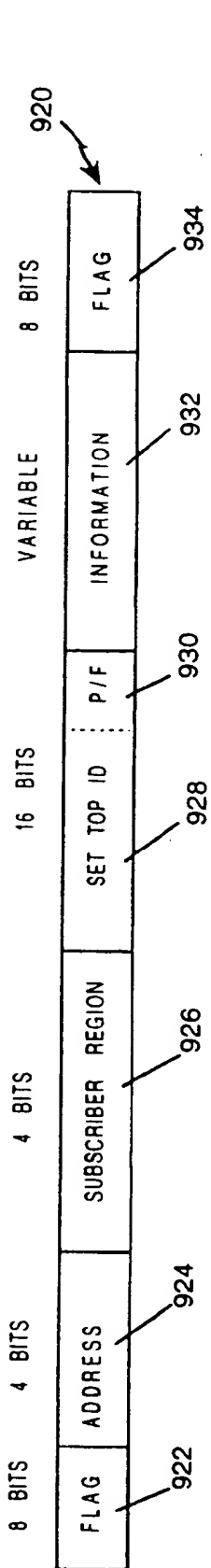
Fig. 6a



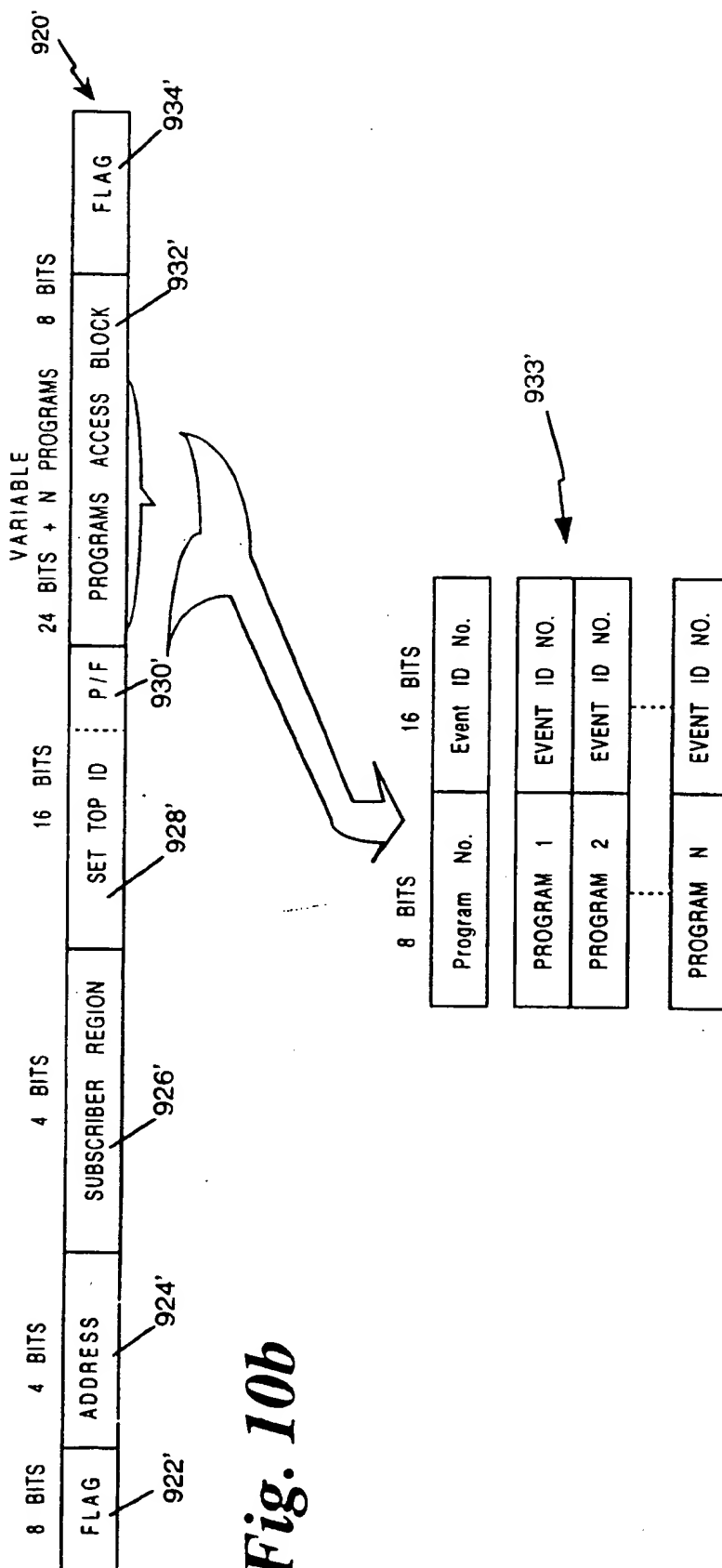
*Fig. 8b*





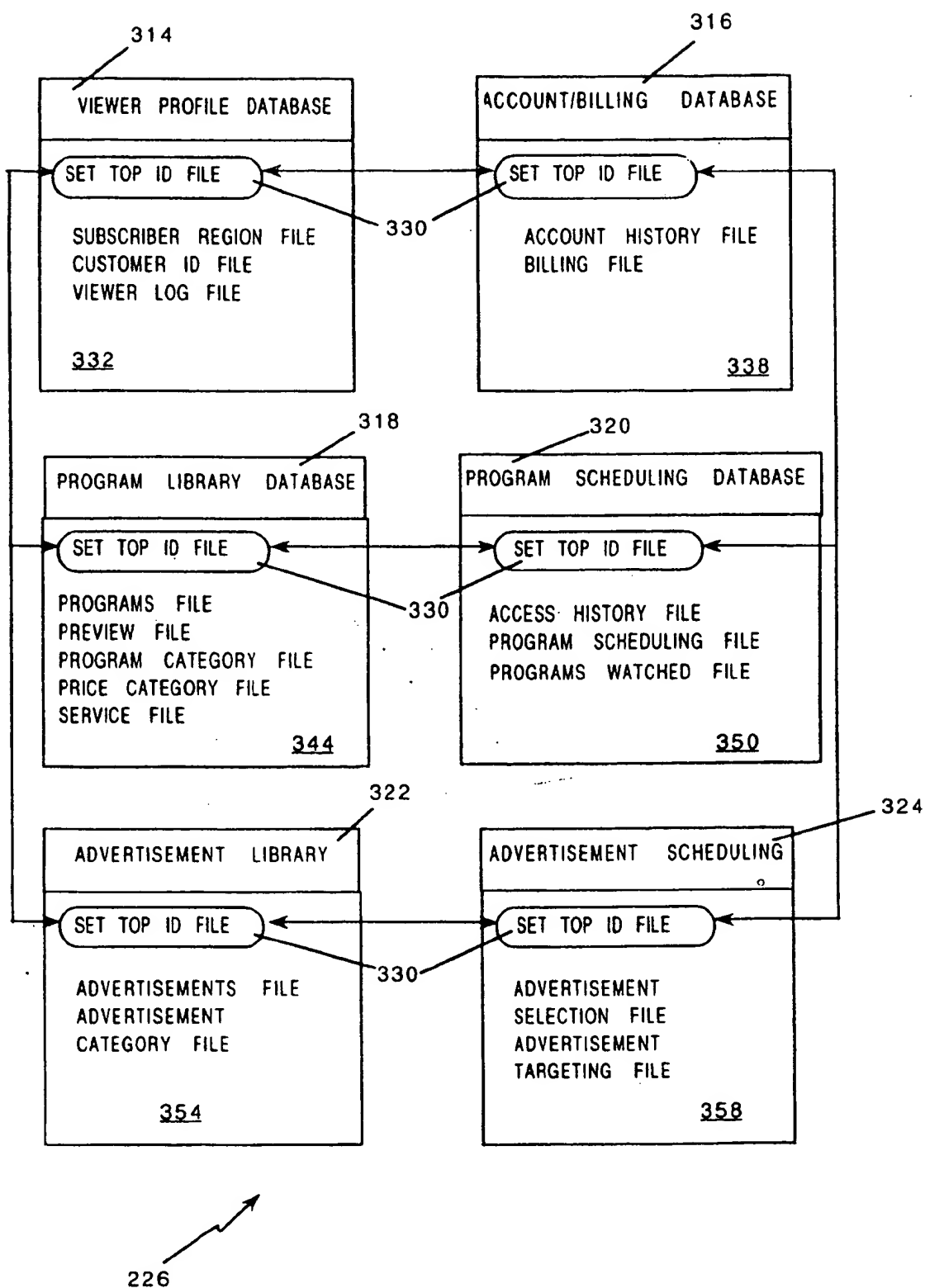


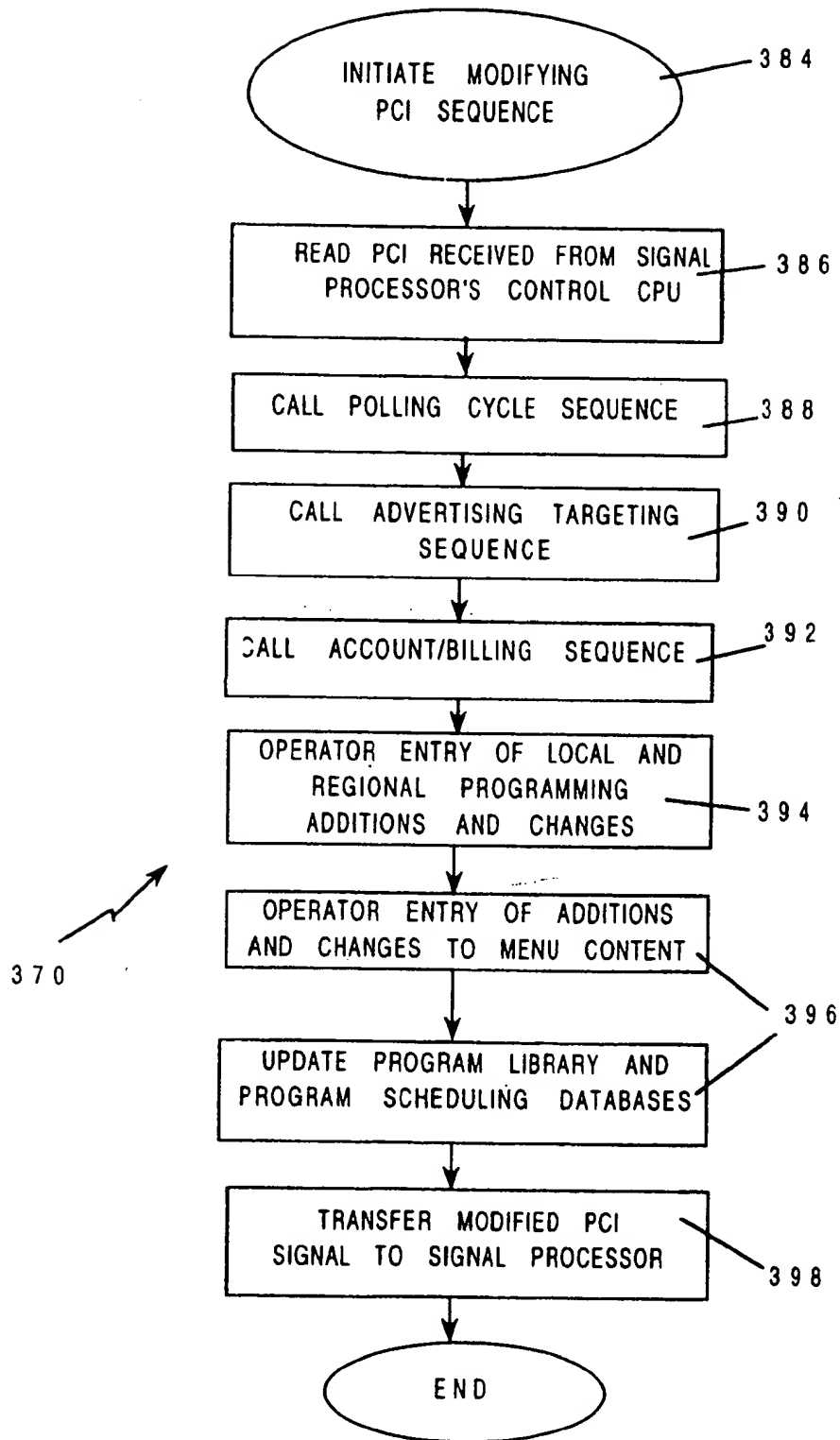
*Fig. 10a*



*Fig. 10b*



**Fig. 12**

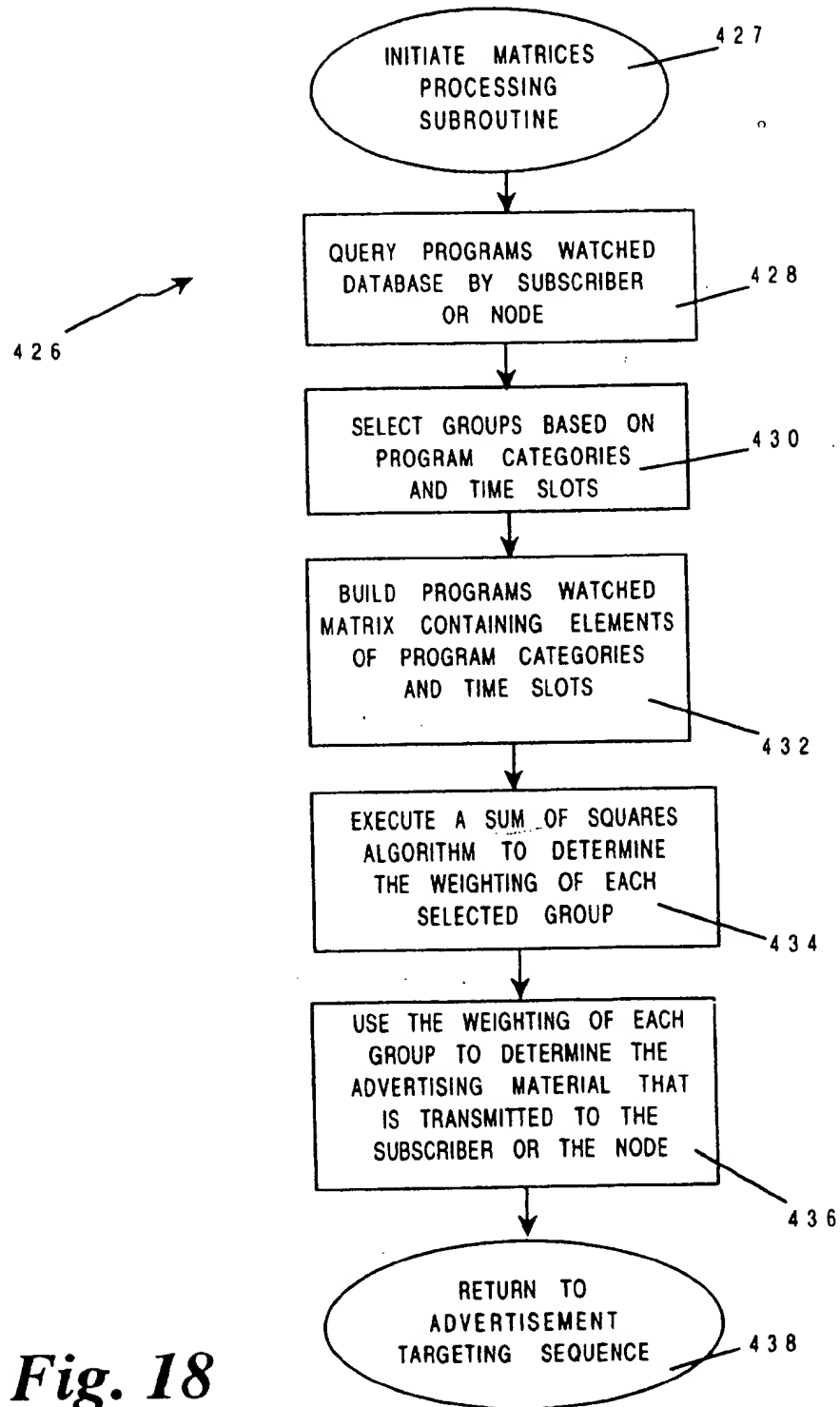


**Fig. 14**

TIME SLOT	SPORTS	NEWS	MOVIES	CHILDREN	ENTERTAINMENT
0000-0400	0	2	2	0	0
0400-0800	0	2	0	3	0
0800-1200	2	0	10	2	6
1200-1600	20	1	3	5	4
1600-2200	8	6	13	0	5
2000-2400	0	10	2	4	2

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**Fig. 16**



**Fig. 18**

SET TOP TERMINAL GROUPINGS	PROGRAM CATEGORIES				
	SPORTS	NEWS	MOVIES	CHILDREN	ENTERTAINMENT
A	I	X	III	IV	VI
B	X	II	X	VII	VI
C	I	X	III	D	D
D	IX	VIII	X	IV	V
E	IX	II	X	VII	V

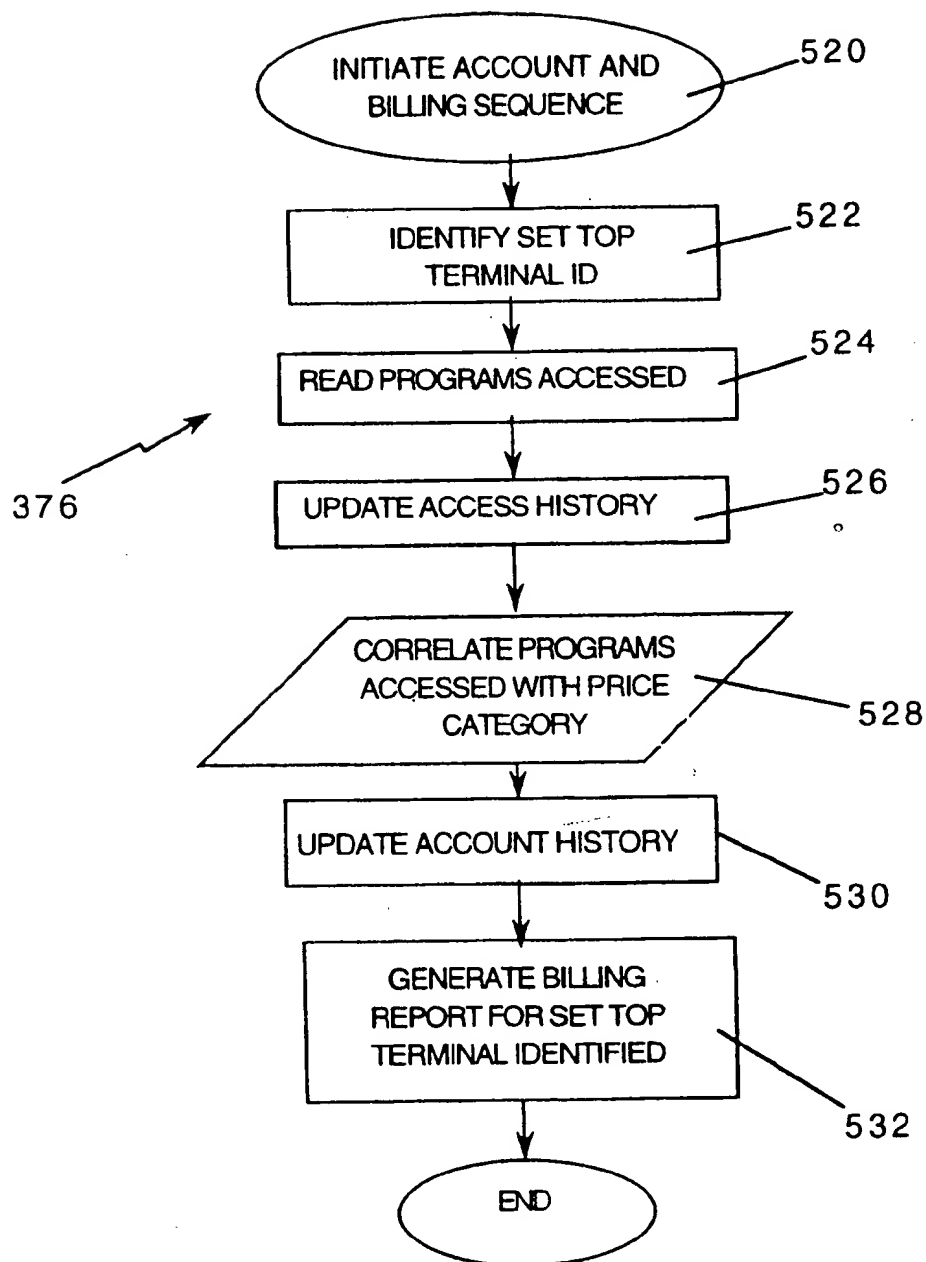
**Fig. 20a**

Diagram illustrating the available bandwidth and channel allocation:

Channel Label	Frequency (MHz)	Category
I	101	COMMERCIAL CHANNELS
II	102	
III	103	
IV	104	
V	105	CHANNELS ASSIGNED
VI	106	
VII	107	
VIII	108	
IX	109	
X	110	

The total available bandwidth is indicated by a double-headed arrow between 101 MHz and 474 MHz.

**Fig. 20b**



**Fig. 22**



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 97 11 2080

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	EP 0 424 648 A (GEN INSTRUMENT CORP) 2 May 1991	1,36,47	H04N7/16 H04N7/173
A	* the whole document *	2-35, 37-46, 48-59	
Y	WO 92 21206 A (ADEXPRESS COMPANY) 26 November 1992	1,36,47	
A	* the whole document *	2-35, 37-46, 48-59	
A	WO 92 17027 A (SCIENTIFIC ATLANTA) 1 October 1992 * the whole document *	1-59	
A	WO 89 09528 A (SCIENTIFIC ATLANTA) 5 October 1989 * the whole document *	1-59	
A	EP 0 402 809 A (MAGUS LTD) 19 December 1990 * the whole document *	1-59	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04N H04M
A	WO 90 10988 A (VIEWFACTS INC) 20 September 1990 * the whole document *	1-59	
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 8 September 1997	Examiner Greve, M
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>			